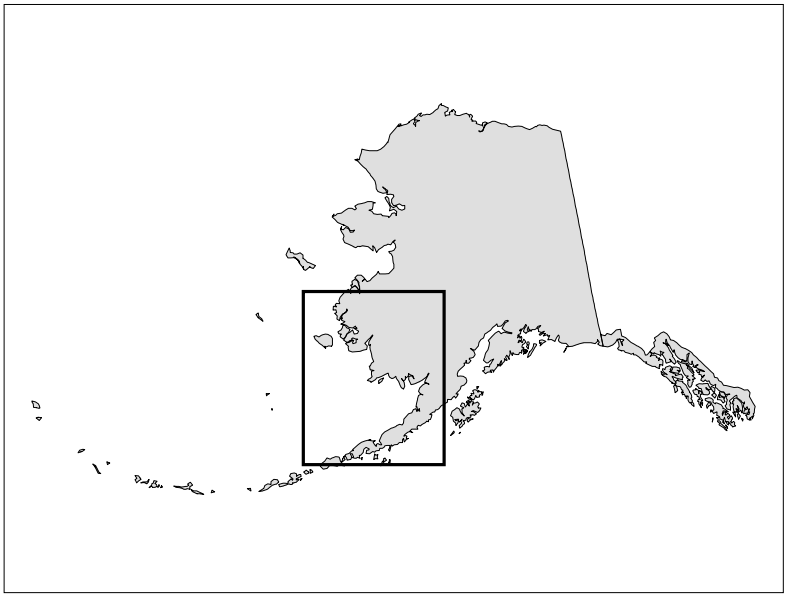
STELLER'S EIDER SPRING MIGRATION SURVEYS
SOUTHWEST ALASKA
2002



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Abstract. Annual spring aerial surveys were initiated in 1992, and repeated in 1993, 1994, 1997, 1998, 2000, 2001, and 2002 to assess and monitor the population status of Steller's eiders (*Polysticta stelleri)* migrating northward in southwestern Alaska. Since the timing of migration varies, two to three replicate shoreline surveys were conducted each spring through 1997, to increase the probability of encountering the entire population of eiders as they transited the survey area en route to their arctic breeding grounds. Fiscal constraints in 1998 and 2000 permitted only one annual survey, the timing of which was carefully scheduled using satellite sea ice imagery and other pertinent data. Replicates were planned in 2001 and 2002, but periods of inclement weather limited us to a single survey each year. The 2002 survey was conducted 4/21 to 4/29. We made visual estimates of Steller's eiders and all other identifiable water birds and marine mammals. The highest Steller's eider count for each year was used as that year's estimate of the prebreeding population. Peak estimates, uncorrected for observer bias, were 137,904 in 1992; 88,636 in 1993; 107,589 in 1994; 90,269 in 1997, 84,459 in 1998, 68,956 in 2000, 58,231 in 2001, and 54,191 in 2002. The 2002 total is the lowest to date, although location data from 4 Alaska-breeding Steller's eiders equipped with satellite transmitters suggest we may have missed some birds due to a major migrational passage during the survey. Unexpanded long-term survey data indicate a 7.6% annual decline in migrating Steller's eiders ($R^2 = 0.86$), which we feel supports continuing the survey, even in the absence of a measure of survey precision. In 2000 through 2002 large continuous habitats within the survey area were sampled using a systematic grid of known-width transects, and the data were expanded accordingly. The expanded totals are 72,953 for 2000, 60,656 for 2001, and 56,704 for 2002. In 1998 we used counts from aerial photographs of 17 flocks to adjust the estimate for observer bias. In 2000, 2001, and 2002 our aerial photo sample was inadequate for such adjustment. We classified observed Steller's eiders into second-year (all-brown birds in flocks consisting mostly of brown birds) and after-second-year birds (all others), as a crude measure of recruitment. By this method we found 12,922 juveniles, or 15.3 percent of total observed, in 1998, none at all in 2000, and 4553 subadults, or 8 percent of total observed, in 2001. In 2002 we recorded no predominately juvenile flocks and only a few immature-appearing birds mixed in with adult-plumaged birds in the Cold Bay area, totalling well below 5 percent of the total estimated population. Patterns of habitat use by Steller's eiders and most other sea duck species during migration was similar among years, indicating numerous important spring habitats. Maps show survey route and distribution of Steller's eiders and other selected seaduck species within the survey area in 2002. Detailed distributional data are available for all observed species upon request.

Key Words: Steller's eider, *Polysticta stelleri*, king eider, *Somateria spectabilis*, migration, population, Aerial, survey, waterfowl, water birds, Bering Sea, Bristol Bay

INTRODUCTION

The majority of the world population of Steller's eiders migrates along the Bristol Bay coast of the Alaska Peninsula in the spring, crosses Bristol Bay toward Cape Pierce, then continues northward along the Bering Sea coast. Most then cross the Bering Strait to their breeding grounds in Siberia, with a smaller number continuing north to the Alaska north slope to breed (Gill et al. 1978). They linger en route to feed at the mouths of lagoons and other productive habitats. From 1981 to present, migrating Steller's eiders were estimated during spring aerial surveys of emperor geese conducted over coastal habitats from Cape Romanzof to and including both the north and south coasts of the Alaska Peninsula. Results of this effort indicate a decline in prebreeding Steller's eider populations during this period, but some of the large between-year fluctuations may be artifacts of survey timing, and a goose-oriented technique that is not optimal for eiders. Concern over apparent declines of eiders prompted the U.S. Fish and Wildlife Service to initiate surveys in 1992 to monitor the population of Steller's eiders that winters in Alaska waters. Since a comprehensive survey of the species is not currently feasible on its extensive and remote winter range, which includes the Aleutian islands, the Alaska Peninsula, and the western Gulf of Alaska including Kodiak and lower Cook Inlet, current surveys estimate their numbers as they stage during migration in Bristol Bay and the Yukon-Kuskokwim Delta. Objectives of the effort are:

1. Obtain an annual estimate of the prebreeding population of Steller's eiders that winter in Alaskan waters.

2. Document distribution of and habitats used by Steller's eiders during migration.

3. Provide additional information on Steller's eiders, such as indications of annual recruitment.

4. Describe populations and distributions of other migrating water birds and marine mammals, to the extent that doing so does not compromise the Steller’s eider objectives.

This report summarizes results and observations from the 2002 Steller's eider survey, with comparisons to earlier surveys.

STUDY AREA AND METHODS

The survey area included sea duck habitats along the coast of southwestern Alaska from Cape Romanzof on the Yukon-Kuskokwim Delta (Y-K Delta) to Chignik Bay on the south side of the Alaska Peninsula. Steller’s eiders are shallow feeders normally found close to shore and in shoals in lagoons, bays and occasionally offshore areas, in water less than 10m in depth. Our objective for coverage was to search adaptively to census all Steller’s eiders within the survey area, as well as the most important concentrations of other sea ducks. We flew a Cessna 206 amphibious airplane over near-shore waters at an airspeed of 90 to 100 kts (166 to 185 km/hr) and an altitude of 150 to 250 feet (46 to 76 m). Habitats within Lagoons and bays were covered using an adaptive contiguous search pattern, while exposed shorelines were surveyed using a single track parallel to the coast within 1 km of the shoreline. The effort required for comparable coverage among surveys varied somewhat, depending upon the aggregate of sightability factors, such as lighting, sea surface condition, and bird distribution. For the Kuskokwim Bay area, we felt we accomplished essentially complete coverage of the dense concentrations of Steller’s eiders south of Kipnuk, using a boundary line drawn around all eider locations from previous surveys,

displayed in a GIS map, as a guide. This line was displayed in our "moving map" navigation system in the aircraft. For the portion of the bay from the Kipnuk shoals to the shoreline north of Goodnews Bay we sampled using a "sawtooth" flight pattern. We also used this technique in some other offshore areas which contained few or no Steller's eiders but large numbers of other sea ducks (Figs. 1 and 2, units 1-4). For analysis, these areas were treated the same as the rest of the survey area before 2000, but in 2000, 2001, and 2002 we extrapolated within these areas using expansion factors calculated as: km^2 of survey area/(linear km of flight lines within the survey area * km transect width). This method renders population indices that account for portions of the survey area that are incompletely covered, but are not comparable to results before 2000, particularly for black scoters, white-winged scoters, long-tailed ducks, king eiders and Steller's eiders. For this reason Table 2 contains unextrapolated data for comparison with historic counts (Table 2).

For geographic reference, the shoreline was historically divided into 126 numbered segments (Larned et al. 1994), most identical to those used for the annual spring emperor goose survey conducted by the U.S. Fish and Wildlife Service, Fairbanks. However, in 1997 we began using a global positioning system (GPS)/laptop computer data collection system which enabled us to electronically record our flight path and the precise location of each observation, so the segments were no longer used. This system, consisting of a laptop computer for each observer, connected by serial cable to the onboard GPS receiver, enabled observers to record observations directly into the laptops. A custom program developed by John Hodges (U.S. Fish and Wildlife Service, Migratory Bird Management, Juneau, AK) recorded our flight path and automatically linked GPS coordinates to each recorded observation. Later transcription , using another special program written by Hodges, produced ASCII data files wherein each line contained a species and number observation plus geographic coordinates, date, and time. We also recorded ancillary data, including tide stage (high, medium, low, unknown), ice cover in tenths, and sea condition (calm, light chop, medium chop to occasional whitecaps, heavy chop with prevalent whitecaps). These auxiliary data are included in separate fields within each line in the output file, but so far have not been included in any data analyses.

The Steller's eider total is considered a minimal population estimate because some birds may escape detection by the survey crew by moving northward during the periods between survey flights, while others may be outside the survey area (north or south) during the survey. While we strive diligently to minimize such errors, we have no way of detecting or measuring shifts that may occur during the survey. In some years we repeated the survey up to three times each year to bracket the spring migration period, using the highest count as that year's Steller's eider estimate. However, in 1998, 2000, 2001 and 2002 only one survey per year was flown. We intended to conduct 2 complete surveys in 2001 and 2002, but were unable due to extended periods of inclement weather. Another source of error is flock estimation bias. We have tried to help measure and account for this bias by taking a representative sample of oblique aerial photographs of flocks which we have also estimated, counting the birds in the photos, then using the resulting ratios to develop a correction factor with variance estimate. While we were moderately successful at this in 1998 (Larned 1998), normally the frequent and sequential diving behavior of Steller's eiders makes obtaining an adequate sample of photographs frustrating and time-consuming, and we have not been successful in this endeavor since 1998.

Our recorded flight path for the survey of 21 to 29 April 2002 is displayed in figs. 1-4. Please note that, due to differences in timing of migration and habitat preferences among species, the coverage described above is not adequate for a complete census of other species within the survey area. Accordingly numeric results for these species are highly variable among years. General interpretive comments for survey results for selected species are included in the RESULTS section of the 1998 Steller's eider survey report (Larned 1998).

Table 1. Total flight hours for spring Steller's eider surveys, southwest Alaska, 1992-02.

Survey No.	1992	1993	1994	1997	1998	2000	2001	2002
1	39.1	35.8	40.2	36.4	35.5	36.9	41.8	42.6
2	32.1	40.4	25.0	34.4				
3	31.3	34.3						

In most years of this survey we observed flocks in Alaska Peninsula lagoons consisting mostly of light-brown Steller's eiders, usually with relatively small numbers of birds with adult-male-looking plumage. Chris Dau (pers. comm.), who has conducted occasional late spring surveys in lower Alaska Peninsula lagoons, stated that it is typical in late-May and early June to have Steller's eider flocks in these areas with all or nearly all brown-plumaged birds, often with a few adult-plumaged males mixed in. We suspect that the latter may be second-year or possibly third-year birds not yet breeding. The majority of other flocks we see during the survey have a fairly even sex ratio, with males and females homogeneously dispersed within each flock. Most females in these flocks are very dark, with a distinct speculum, bordered by faint white bars that are usually visible in flight. Although Dau (pers. comm.) suggests that females usually do not attain this dark adult plumage until the Alternate II molt , we feel it is reasonable to assume that most of the brown birds in the late-migrating (or non-migrating) predominately brown flocks are second-year birds (based on the very small numbers of adult-plumaged males present, and our assumption that the proportion of after-second-year females not yet breeding would not be higher than that of males). We have recorded and totaled estimates of the brown bird components of these flocks, and provide the results as a crude index to annual recruitment. We have not attempted to determine the relative contributions of the Russian vs. Alaskan breeding grounds to the total recruitment estimate. We have seen most of these immature birds among flocks on the lower Alaska Peninsula; at the end of the migrational procession. Presumably many or all of these young birds will spend the breeding season south of the Arctic breeding grounds, many remaining in Alaska Peninsula lagoons and bays.

The aerial survey crew since the beginning of the survey in 1992 has consisted of Bill Larned as pilot and port observer, with various starboard observers. In an effort to minimize the effects of observer bias, only experienced aerial observers were used, the pilot intentionally maneuvered the aircraft so that the majority of larger eider flocks were on his (the pilot's) side for estimation, and observers received training in flock estimation, using a computer simulation program (Wildlife Counts by John Hodges, USFWS, Juneau, AK), and aerial photographs of eider flocks. Paul Anderson functioned as starboard observer in 2002.

RESULTS AND CONCLUSIONS

Habitat and survey conditions

The winter of 2001-2002 was mild, with limited ice extent and early appearance of extensive leads in the eastern Bering Sea. As in 2001, by mid-April there was much open water along the Y-K Delta coast and through the Bering Strait, which is earlier than usual for an open travel lane for migrating eiders. This may have provided an opportunity for some Steller's eiders to move north out of the survey area before we commenced the survey, while normally they are late migrants that linger in Bristol Bay and YK Delta coastal habitats until late April or early May before proceeding northward.

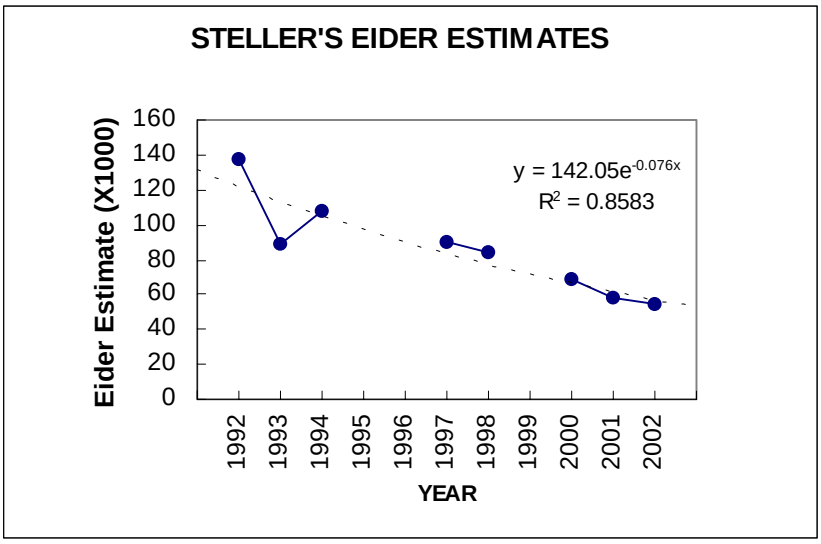
The survey starting date was delayed until 21 April due to inclement weather, and we were grounded again on 4/22 and 4/27-28. Otherwise, survey conditions were good for most of the area, with light winds and calm seas allowing us to survey offshore safely.

Itinerary for 2002 survey

4/15	Flew survey aircraft from Anchorage to Bethel.
4/16-17	Grounded in Bethel due to inclement weather.
4/18	Flew 3.4 hours for reconnaissance of Toksook Bay to Kuskokwim River mouth to evaluate survey timing (progress of Steller's eider migration). Determined that unfavorable weather would prevail for several days, so traveled to Anchorage via airlines.
4/21	Flew via airlines to Bethel early AM, then conducted 4.6-hour survey flight covering the south side of Nunivak Island.
4/22	Grounded in Bethel due to high winds, low ceilings and reduced visibility in fog.
4/23	Conducted 5.6-hour survey flight from Kuskokwim River mouth to 40 km south of Toksook Bay.
4/24	Conducted 5.6-hour survey flight from Bethel toDillingham, stayed overnight in Togiak National Wildlife Refuge bunkhouse.
4/25	Conducted survey flight to King Salmon, refueled, then another survey flight Naknek River to Cinder River Sanctuary, then returned for overnight at King Salmon bunkhouse. Total flight time: 5.4 hours.
4/26	Flew directly to Cinder River Sanctuary, then Conducted Survey flight to Cold Bay. Stayed overnight in Cold Bay.
4/27-28	Grounded due to high winds and rain. Stayed overnight at refuge bunkhouse at Cold Bay.
4/29	Surveyed Izembek NWR and local lagoons (flight time 2.8 hours). Flew directly back to King Salmon and stayed overnight at refuge bunkhouse (flight time 3.0 hours).
4/30	Flew survey aircraft to Anchorage. End of survey.

Steller's eider results

The 2002 unadjusted Steller's eider estimate of 54,191 is the lowest annual estimate in the 11-year (8 survey year) history of the survey, and is 37 percent below the mean of all 8 annual estimates (highest annual estimates) (Table 2). The adjusted figure using numbers extrapolated from sampled portions of the survey area (56,704) is also below all other adjusted and unadjusted annual estimates. The 2002 total also closely follows a downward trend noted previously (Larned 2001 and graph below).



In 1998, we classified 12,922 birds, or 15.3 percent of the Steller's eiders observed, as second-year birds based on plumage characteristics (Larned 1998). In 2000, we observed no flocks containing a predominance of brown-plumaged birds, suggesting minimal recruitment for the 1999 breeding season. In 2001, we recorded 4,553, or 8 percent of the total 58,231 Steller's eiders observed, as second-year. Most of these birds were in flocks consisting mostly of brown-plumaged birds, but also containing several birds that had plumage characteristics of adult males (white wings and heads). In 2002, aside from a few brownish individuals in flocks of adults observed in lagoons on the lower Alaska Peninsula, we did not record any obvious second-year flocks.

The distribution of Steller's eiders during the survey this year was a bit more southerly than we expected considering the mild early spring (Figure 5). The pattern of habitat use by concentrations of eiders was similar to that seen during previous years' surveys.

King eider

We apparently surveyed this year after the main pulse of king eiders migrated northward out of the survey area, as the total number estimated was 17,494 (adjusted estimate 48,077), compared with 211,988 (219,403) estimated in 2000, and the long-term mean of 98,294 (Tables 1, 2). In our experience during this annual survey, most king eider flocks are very homogenious: either breeding adult or juvenile/subadult, based on plumage characteristics. In mid-April of 1997 we encountered 42,254 mostly hatching-year birds in large dense flocks along the Alaska Peninsula. In 2000 we recorded only 350 obviously hatching-year king eiders, while in 2001 we tallied 14,678 individuals of this age cohort, and 8,613 in 2002. This may provide a relative index to recruitment from the previous year as in the case of Steller's eiders, though it should be considered minimal, as an unknown portion of the non-breeding component may delay, or forego altogether, arrival in the Alaska Peninsula lagoons.

Other seaducks

Estimates of common eiders, long-tailed ducks, and scoters were all smaller than those of 2000, probably owing to phenologically-late survey timing, as these species are known to be early migrants.

Table 1 lists 2001 results for seaducks, brant and emperor geese by geographic area, with expanded estimates for the four sampled areas. Table 2 lists highest annual survey totals for all species for all survey years since 1992. Figures for 2001 and 2002 are unexpanded in Table 2 to facilitate comparison among years, so will not necessarily agree with those in Table 1.

CONCLUSIONS AND RECOMMENDATIONS

Although this survey is admittedly a rough census of a "moving target" of birds actively migrating northward, with no statistically-valid measure of precision, our confidence in the developing downward trend increases as the annual estimates accumulate. Caution dictates that we proceed carefully and attempt to refine our methods and/or develop another independent measure of trend.

This year we had some satellite telemetry data which helped to interpret our survey data. A small sample of 3 male and 1 female Steller's eiders with transmitters remaining functional through May indicated that three of these birds migrated to the Kuskokwim Bay area from Alaska Peninsula Lagoons between 24 and 26 April, the fourth having moved there a few days earlier, and all remained there until late May before continuing to the breeding grounds (Phillip Martin, Pers. comm.). This suggests two important things, assuming that these four birds, which were surgically implanted with satellite transmitters in June of 2001 near Barrow, AK, were behaviorally representative of the population of eiders wintering in southwest Alaska: 1. Since they did not move north of Kuskokwim Bay until late May, the large numbers of eiders we have seen annually staging in the Kuskokwim Shoals area may typically linger there to feed for several weeks, well into May, before continuing north, thus providing an opportunity to count them there before they leave in late May. 2. The coincidental timing of the movement of three of these four birds to Kuskokwim Bay with our survey crew movement from Bethel to the Alaska Peninsula suggests that we may have missed a substantial portion of the population as it bypassed us on its way north. These points suggest that the best timing for the survey this year at least, and perhaps for other years, might be in early May, when most of the eiders are established in the Kuskokwim Bay staging area. However, this was a very small sample, they were experimental birds having undergone transmitter implantation surgery, and were all from the same very small nesting colony, so the assumption of these birds being representative is shaky – but still worthy of consideration. Another factor to keep in mind pertaining to a May survey effort focused on the Kuskokwim Bay staging area is the potential for conflicts with subsistence seal hunters. It would necessitate careful coordination and possibly development of a lower-impact survey technique, such as higher altitude sampling using digital photography or videography.

ACKNOWLEDGMENTS

I gratefully acknowledge the assistance of the managers and staffs of Alaska Peninsula/Becharof, Izembek, Togiak, and Yukon Delta National Wildlife Refuges, who provided for the logistic needs of the survey crew. I also sincerely appreciate the help of starboard observer Paul Anderson, who performed his task competently and enthusiastically for the second consecutive year.

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PERSONAL COMMUNICATIONS

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Table 1. Seaduck and goose estimates for geographic aerial survey units, spring Steller's eider survey, southwest Alaska, April 2002.

Survey Unit	Date surveyed	Elapsed Time	Steller's eider	King eider	Common eider	Long-tailed duck	Harlequin duck	Black scoter	White-winged scoter	Surf scoter	Unknown scoter	Black brant	Emperor goose
Scammon Bay to Toksook Bay	not surveyed												
Nunivak Island	4/21	1:21	1,665	118	298	109		6					
Toksook Bay to Kuskokwim R.	4/23	4:03	26,923	51	19	685		4	2				
Kuskokwim R. to Security Cove [1]	4/24	2:00	3,249	417	70	2,551		61	948				
Goodnews Bay	4/24	0:26	1,653		1	148		6	2				
Chagvan Bay	4/24	0:08	5,521									10,445	
Nanvak Bay	4/24	0:05										50	40
Nanvak Bay to Togiak Village	4/24	0:52	54	3	10	287	4	55	22				
Togiak Vilage to Kulukak Bay	4/24	0:25	12		100	77	125		4				
Kulukak Bay to Cape Constantine[1]	4/24 & 4/25	0:38	3			55		491	286	43			
Cape Constantine[1]	4/25	0:26	3	2,625		41		342	203				
Kvichak Bay [1]	4/25	1:37		33,208	10	7,553		15,442	56	56			
Naknek River to Port Heiden	4/25	1:11	7	63	28	1,034		883	453		241		
Egegik Bay	4/25	0:17	805	31	12	340		1,707	10				848
Ugashik Bay	4/25	0:16				3,998		2,425	41	6			2,437
Cinder River Sanctuary	4/25	0:10			5			50					11,550
Port Heiden	4/26	0:54	6,611	5,185	112	547		2,612	32		66		14,109
Port Heiden to Moffet Bay	4/26	1:51	991	3,076		889	27	2,822	607	9	3,655		
Seal Islands Lagoon	4/26	0:15	538			2		22					3,195
Port Moller	4/26	0:49	1,232	730	2	131		1,119	40				
Nelson Lagoon	4/26	0:20	3,728	2,570		100							9,230
Izembek Lagoon	4/29	1:46	3,707		2	4	36	71				24,525	1,580
Kinzerof Lagoon	4/29	0:09					17	9				40	25
Morzhovoi Bay Lagoons	4/29	0:09										90	
Hook Bay	4/29	0:09					64					460	
Catherine's Cove	4/29	0:07	2				10	32					
Other areas	4/29	10:00				155	155	1,091		4			
Totals			**56,704**	**48,077**	**669**	**18,551**	**438**	**29,250**	**2,706**	**114**		**35,610**	**43,014**

1. Estimates reported for these survey units were expanded using a factor calculated as: area of survey unit/(length of transect x transect width). Survey areas extrapolated to are illustrated in figures 1-2.

Table 2. Survey totals for all species, Spring Steller's eider surveys, southwest Alaska, 1992 to 2002. For years with replicate surveys (1992-1997) only the highest count for each year is shown. For consistency with data prior to 2000,this table contains only unexpanded estimates from sampled areas. See Table 1 for expanded estimates of selected species.

SURVEY DATES:	4/9-5/6/92	4/6-5/8/93	4/15-5/12/94	4/15-30/97	4/22-29/98	4/17-23/00	4/22-5/1/01	4/21-29/02	average[7]
Red-necked grebe	32	793	221	178	29	114	316	186	234
Horned grebe			3			2			1
Common loon	5	13	13	8				5	6
Yellow-billed loon	2							1	0
Pacific loon	2	30	34	45	23	5	3		18
Red-throated loon	78	51	270	11	97	61	188	64	103
Unident. loon			85	7	24	3	137	23	35
Pigeon guillemot			1	8	50	2	60		15
Unident. murre 1	985	56,183	2,204	42,544	28,334	1,839	119	7	16,527
Arctic tern	53	249	836	3			87		154
Mew gull	3,419	3,872	2,141	3,482	6,699	2,741	2,018	15	3,048
Black-legged kittiwake	68,888	26,579	6,614	41,957	28,333	2,624	479	10,845	23,290
Sabine's gull		166	173		10				44
Large gull 2	18,072	49,378	24,865	27,738	25,769	7,991	9,249	15,622	22,336
Jaeger		4	5		1	1		3	2
Cormorant 3	979	1,082	1,618	829	653	335	674	483	832
Common merganser				10	2	6		14	4
Red-breasted merganser	2,103	1,176	2,766	660	1,393	208	211	634	1,144
Mallard	88	27	39	107	2	97	15	20	49
American wigeon	4		8	2	79	2			12
Am. Green-winged teal			75	2	1			35	14
Gadwall	5	2	15		10	2			4
Northern shoveler	28	2	14		3		4		6
Northern pintail	5,325	1,792	1,760	1,414	893	857	618	1,431	1,761
Canvasback		3	57		2				8
Scaup 4	11,106	5,316	6,598	3,072	2,289	1,864	1,188	1,465	4,112
Goldeneye	711	177	263	365	136	319	181	222	297
Bufflehead	36	66	400			2			63
Long-tailed duck	20,512	13,184	22,987	25,548	22,025	11,569	7,756	10,197	16,722
Harlequin duck	757	608	838	328	243	373	946	438	566
Steller's eider	**137,904**	**88,636**	**107,589**	**90,269**	**84,459**	**68,956**	**58,231**	**54,191**	**86,279**
Spectacled eider	40	26	35	20	16		4		18
Common eider	5,941	5,069	6,997	21,916	3,862	2,925	3,604	615	6,366
King eider	87,954	62,544	69,638	241,992	71,438	211,988	23,302	17,494	98,294
Unident. scoter	361			1,474	136			3,962	742
Black scoter	42,382	37,985	35,672	31,750	45,312	19,931	19,521	15,402	30,994
White-winged scoter	1,331	432	484	2,080	2,520	2,696	1,345	1,594	1,560
Surf scoter	23	347	48	359	8	17	17	41	108
White-fronted goose		430	30	80	54		94		86
Canada goose	169	28	34	57	210	26	97	2	78
Black Brant	5,289	81,743	71,551	80,099	34,045	58,212	74,851	35,610	55,175
Emperor goose	27,876	28,542	25,816	41,279	53,926	32,562	41,816	43,014	36,854
Tundra swan	2	9	2	24	46		7		11
Sandhill crane	4	21	10		2				5
Small shorebird 5			9,737	40,540	9,997	13,990	456	5,262	9,998
Large shorebird 6			47		15				8
Bald eagle	24	78	29	23	22	17	24	19	30
Common raven			1	9	5				2
Sea otter	1,736	981	809	1,554	1,068	809	523	442	990
Pacific walrus	229	315	1,030	143	136	110	1		246
Seal	588	1,976	2,130	1,156	620	438	1,617	4,191	1,590
Steller's sea lion	314	902	833	934	1,033	42	8	13	510
Harbor porpoise	17	9	5	8	1	12		6	7
Belukha whale	80	10	67	100		62			40
Orca whale	1			6					1
Grey whale	92	114	94	102	57	37	14	30	68

1. Mostly common murre, may include thick-billed. 2. Lumped due to observer inconsistencies. Includes glaucous, glaucous-winged, and herrin gulls. 3. Lumped due to observer inconsistencies. Includes pelagic, red-faced and double-crested. 4. Mainly greater scaup.
5. Incl. plovers, lesser yellowlegs, all sandpipers, phalaropes, dowitchers, common snipe, turnstones, surfbird, dunlin and others
6. Incl. godwits, whimbrel, Bristle-thighed curlew, greater yellowlegs and others. 7. Mean of highest annual estimates.